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Tanzania's 2010–2015 Development Plan and Industrial Growth

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Abstract *Tanzania is striving to become a middle income country by 2025. So plans are laid down and efforts put forward to industrialize the economy. In 2010 the government initiated a Five Year Development Plan 2010–2015, aiming at promoting industrialization. This work analyzed the effect this development plan had on industrial output with 45 industries observed in both 2009 and 2013. The findings show that industries were more productive in 2013 than in 2009. Output, labor and energy have all grown positively from 2009 to 2013. It is proposed that this development plan effectively improved industrial production. For fast industrial growth, more is desired from the government, for instance, improved roads, railways, airways and marine transportation.*

Key words Industrial growth; economic growth; development policies

JEL Codes: O20, O25, O40

1. Introduction

Tanzanian government strives in transforming its economy to become a middle income country by 2025. The current government is preparing a platform for industrialization to the extent that the 2015 election slogan was "Tanzania of industries". The government continues with implementation of its National Development Strategy for industrial development by promoting investment in basic industries, for example, Export Processing Zones Authority (EPZA), Small and Medium Industries. Industrial sector is one among priority sectors in building the country's economy and alleviating income poverty (URT, 2016). Industries cannot operate without electricity and therefore efforts are put forward by the government to supply electricity in all the villages in the country. The expenditure on electricity almost more than doubled from Tanzanian shillings 1,025,286 million in 2009 to 2,033,379 million in 2013. Statistics show that the manufacturing subsector grew at 6.5 percent in 2013 mainly due to continued stability in electricity generation at about 13 percent in 2013 (NBS and MITI, 2016; URT, 2016).

The study utilizes industrial census data for 2009 and 2013 to effectively analyze the effect of a Five Year Development Plan 2010–2015. This plan is an intervening strategy in the Sustainable Industrial Development Policy (SIDP) 1996–2020 and the Integrated Industrial Development Strategy (IIDS) (URT, 2016). Therefore, 2013 is an ideal period giving enough space for the policy effect to manifest. This paper hypothesizes that the implementation of the Five Year Development Plan 2010-2015, has improved electricity generation, accounted in energy supply, in the country and therefore improved industrial production.

2. Literature review

Firms differ in policy shock responses in accordance with their sizes. Small firms respond much quicker than large firms. Monetary shocks response, for instance, is a function of capital size. Large firms have ability to finance production from reinvested dividends. However, monetary shocks have less impact on real factors compared to financial factors. Small firms also grow much faster than large firms as they pay fewer dividends than large firms and can easily relocate resources (Cooley and Vincenzo, 2006). The response of small firms is impressive even on research and development programs. When they receive grants, small enterprises increase investments on average by almost the same size of the grant they received (Bronzini and Eleonora, 2014).

High labor participation with increased working hours is essential to the increased industrial productivity. The difference in labor participation behavior explains the difference in levels of economic growth for different countries. However, with well-established policies protecting workers like reduced tax rates and low security funds contribution, many people are likely to participate in the job market. Both monetary and fiscal policies that stabilize the economy effectively influence output growth (Papademos, 2006). In the presence of a sound macroeconomic environment that is stable, factor accumulation is likely to engineer economic growth in an economy. In addition to factor accumulation, productivity growth maintains a stable economic growth as this directly translates on how factors of production are effectively utilized in the economy. Australian

economy, for instance, shows higher contribution of factor accumulation on output growth compared to productivity. During 1964-65 to 1973-74 inputs contributed for about 71 percent of output while 29 percent came from productivity, in 1973-74 to 1990-91 76 percent came from input and 23 percent was from productivity, and in 1990-91 to 1998-99 57 percent was a contribution from inputs and 43 percent came from productivity. The contribution of productivity improved much on the last phase (Parham, 2000). The growth miracle of the East and South East Asian, for instance, is said to be influenced by seven factors, namely; rapid economic growth and reduced inequality; rapid output and productivity growth in agriculture; relatively higher rates of manufactured exports; earlier and steeper decline in fertility; higher growth rates of investments, supported by higher saving rates; higher growth rates in human capital; and higher rates of total factor productivity growth. These factors led into a regional growth story that is different from other developing countries (Davis, 2000).

The absorptive capacity and institutional arrangements which differs from region to region, plays a central role in explaining the differences in effectiveness of policies. The transfers to regions, for instance, have different output growth outcomes due to the fact that different regions have different levels of human capital and institutional arrangement which explains their difference in absorption capacity. Regions with high levels of human capital and good institutions tend to have higher output and investment growth, with faster catch-up speed compared to regions with lower levels of human capital and poor institutions (Becker *et al*., 2013).

Tanzania has undergone several economic reforms since independence in 1961. The 1967 reform was for socialism and self-reliance and almost all enterprises became state owned. But, underperformance combined with the 1970s oil crisis together with the fall in coffee exports worsened the economic situation. Nevertheless, the 1980s drought increased the hardship with fewer products in the economy and skyrocketing inflation rate. The government adapted structural adjustment programs in 1986 to become a more market oriented economy which started easing economic hardships in early 1990s. Improvements are experienced in production with privatization, allowing importation and curbing inflation with good financial management practices which made the country one of the leading reformers in Africa. However, much is still needed to curb infrastructural bottlenecks like roads, energy supply, good education facilities to provide human capital for modern economy, and health services (Nord *et al*., 2009).

3. Methodology of research

3.1. Data

The data used are industrial census for 2009 and 2013 from different publications of Tanzania National Bureau of Statistics (NBS). The two sets of data allows to see the effect of Five Year Development Plan 2010 – 2015 on industrial performance, given the fact that three years, from 2010 to 2013, provide enough room for policy outcomes to manifest. Since the data for industries with less than 10 employees are not available for 2009, the study does not apply the data for this category even if they are available for 2013. So industries with more than 10 employees form the only industry category applicable in this study. Nevertheless, the study uses aggregate data for each industrial activity forming a unit of analysis which limits information compared to when individual firms form the units of analysis. Even though the findings still highlight the impact of the Five Year Development Plan 2010 – 2015 on industrial growth. Industrial activities included in the analysis are those found in both years, which means industries in 2009 are repeated in 2013. Therefore, 45 industries used in 2009 are repeated in 2013.

To check the effect of this policy on industrial production, the study uses gross output from each industrial activity as a dependent variable. The total labor cost in the production and total energy consumption, which are taken as inputs, form two independent variables. The policy dummy, which takes the values of one for 2013 and zero for 2009 to capture the effect of the five year development plan, is also included as an independent variable. The data are all given in 1,000 Tanzanian Shillings, the local currency.

3.2. Model Specification

The study uses the Cobb-Douglas production function formulation with constant elasticity assumption. Since this study also analyzes input elasticity of output, this popular and commonly used production function provides a useful model for this study. The model generally takes the form:

$$Y = L^{\beta_2} K^{\beta_3} e^{(\beta_0 + \beta_1 T_i + u_i)} \quad (1)$$

This model cannot be estimated in its natural form because it is not linear in parameters. Therefore, the natural logarithm is introduced to make the model linear in parameters. This turns equation (1) to be:

$$\ln(Y_{it}) = \beta_0 + \beta_1 T_i + \beta_2 \ln(L_{it}) + \beta_3 \ln(K_{it}) + u_{it} \quad (2)$$

Where; T_i is a policy dummy taking the value of 1 if 2013 and 0 if 2009, L_{it} stands for labor which includes wages and salaries in the i^{th} industry in t^{th} period, K_{it} is the energy cost in the i^{th} industry in the t^{th} period, $Y_{it}$is the gross output of the i^{th} industry in the t^{th} period, and u_{it} is the error term which is assumed to be independently and identically distributed. B_0 is the constant coefficient for the base year 2009, β_1 is the coefficient for the year 2013 measuring the magnitude of difference in production between 2009 and 2013. The coefficient β_2 is the labor elasticity of output, and β_3 is the energy elasticity of output.

Equation (2) can be written in its empirical form as equation (3):

$$Output_{it} = \beta_0 + \beta_1 Policy_i + \beta_2 Labor_{it} + \beta_3 Energy_{it} + u_{it} \quad (3)$$

3.3. Model Estimation

When the model suffers neither functional form misspecification nor heteroskedasticity, OLS estimator provides consistent and efficient estimates. But when these problems are pronounced in the model, estimates from OLS estimator become inconsistent and inefficient. Under such circumstances, weighted least square estimator is favored. Since the data set is almost cross sectional, the two mentioned problems must be checked for, thereby calling for two most important post estimation tests under cross sectional data set, as illustrated in the following section.

3.4. Post Estimation Tests

Stability Test

The study performs stability test to check functional form misspecification. The presence of omitted variables which are correlated with independent variables makes OLS estimates biased. Functional form misspecification may lead into a failure to reject the null hypothesis of no heteroskedasticity. Therefore, before undertaking heteroskedasticity test, regression specification error test (RESET) is performed. The square and cubic forms of the fitted values of the dependent variable are added in equation (3) to check whether nonlinear variables have been omitted in the model.

$$Output_{it} = \beta_0 + \beta_1 Policy_i + \beta_2 labor_{it} + \beta_3 energy_{it} + \delta_1 \hat{y}^2 + \delta_2 \hat{y}^3 + error_{it} \quad (4)$$

In equation (4), F–statistic is used for testing null hypothesis, H_0: $\delta_1 = 0$, $\delta_2 = 0$ which reads as "no functional form misspecification". A lower F–statistic with higher probability value exceeding 5 percent leads into a failure to reject the null hypothesis.

Heteroskedasticity Test

When the linear model is well specified, the presence of heteroskedasticity in the disturbance term leads into consistent but inefficient parameter estimates and inconsistent covariance matrix estimates which invalidate standard errors used in drawing inferences (White 1980). The procedure as illustrated in Wooldridge (2013), is to estimate equation (3) by OLS and save the estimated residual. The estimated residual is squared and regressed on the independent variables, their squares and their cross products as in equation (5) below:

$$\hat{u}_{it}^2 = \delta_0 + \delta_1 Policy_i + \delta_2 labour_{it} + \delta_3 energy_{it} + \delta_4 Policy_i^2 + \delta_5 labour_{it}^2 + \delta_6 energy_{it}^2 + \delta_7 Policy_i labour_{it} + \delta_8 Policy_i energy_{it} + \delta_9 labour_{it} energy_{it} + error_{it} \quad (5)$$

Here, the null hypothesis, that all coefficients except intercept are zero, is tested. Lower values of *F* or *LM* statistics indicate no heteroskedasticity.

4. Findings and discussions

4.1. The Industrial Growth of Output and Inputs from 2009 to 2013

The section explains the characteristics of industrial output, labor and energy consumption. Their average values, that is, the sum divide by the total number of industries, as well as their growth rates from 2009 to 2013 as shown in Table 1. This highlights on improvements in industrial sector and foretell the possible causal direction. From Table 1, it is clear that industrial energy consumption has grown faster than output and labor. In four years, energy consumption has grown at a rate of about 2.02 and could roughly mean an annual growth rate of 0.51. In terms of correlation, it shows that energy

consumption growth has a lower effect on output growth as compared to labor growth. This is because, labor has grown slowly compared to output and energy. With a growth rate of about 1.4 in a four year period, or about 0.35 on annual basis, labor is growing slowly compared to energy consumption. This is an indication that labor has a larger positive impact on output growth. Output has also been positively growing with a four year growth rate of 1.62 and annual growth rate of 0.40. On average, the industrial sector in Tanzania has been positively growing for the sample period under consideration.

Table 1. Average Values and their Growth Rates

	Average Values in 1,000 Tanzania Shillings		Growth Rate	Annual Growth Rate
	2009	2013		
Output	134363484.3	351636496.7	1.62	0.40
Labor	11944384.84	28624264.78	1.40	0.35
Energy	10714416.56	32386163.8	2.02	0.51

Source: NBS (2012); NBS and MITI (2016).

4.2. Post Estimation Test Results

After ordinary least square estimation, the regression specification error test, RESET, is carried out to check whether the functional form is properly specified. The results for Ramsey RESET test, as displayed in Table 2, show that there is no functional form misspecification. The calculated F(2,84) statistics of 0.41 is far less than the critical value of 2.04, which makes us fail to reject the null hypothesis of no functional form misspecification at 5 percent levels of significance.

Table 2. Post Estimation Test Results

	Ramsey RESET Test	Heteroskedasticity Test
F(2, 84)	0.41	
F(8, 81)		0.74
Critical F-Statistics	2.04	2.04

Since there is no functional form misspecification in the ordinary least square regression, we proceed testing for the presence of heteroskedasticity in the error term. As it can be observed from Table 2, the calculated F(8,81) statistics of 0.74 is less than the critical value of 2.04, so the study fails to reject the null hypothesis of no heteroskedasticity at 5 percent levels of significance. This means that the standard errors used to make inferences in this study, from OLS estimator, are valid and therefore our inferences are also valid. There is no need to go further to the weighted least squares because ordinary least squares estimator, in this case, provides the best estimates.

4.3. Model Estimation Results

The model estimation results for ordinary least squares are provided in Table 3. All the variables are statistically significant at 5 percent levels of significance, with their signs as expected.

Table 3. Model Estimation Results

Variable	Coefficient	t-Value
Constant	3.83***	6.16
Policy	0.33**	2.11
Labor	0.62***	5.74
Energy	0.29***	3.47
R-Square	0.899	
Adjusted R-Square	0.896	
Observations	90	

Note: ***, **and * indicates significant at 1, and 5 and 10 percent, respectively.

The model explains about 89.9 percent of the variation in the industrial output level. So the model provides a good fit, because only about 10.1 percent of the variation is not explained in the model. Labor affects industrial output positively as expected. This means, as industries grow in terms of capital, more people get employed in an industry, and therefore more output is being produced. In this analysis, other factors held constant, a 10 percentage increase in labor increases industrial output by about 6.2 percent, and the effect is statistically significant at 5 percent levels of significance.

Energy has a positive and significant effect on industrial output as expected. Holding other factors unchanged, a 10 percentage increase in energy consumption increases industrial output by about 2.9 percent, and the effect is statistically

significant at 5 percent levels of significance. This also shows that more hours of production needs more energy and therefore more output results from more energy consumption in an industry. In other words, as industries expand, energy consumption increases, and therefore more output is produced. The Policy dummy has a positive and expected effect on industrial output. The implementation of the 2010–2015 Development Plan, in Tanzania, has resulted into an improvement in industrial production. The industrial output in 2013, after three years of policy implementation, is about 33 percent higher than the industrial output in 2009, before the implementation of the policy. This difference is economically and statistically very significant at 5 percent levels of significance.

5. Conclusions

This study aimed at analyzing the effect of the 2010–2015 Development Plan on industrial production in Tanzania. The findings show that the plan had a positive impact on the industrial sector in three years of implementation. The government plays an important role in providing the platform for industrial growth which later translates into industrial development. As it has been pointed previously, the government is necessary in providing infrastructure, and supply of energy for proper functioning of industrial sector. The point of infrastructure is important and can be seen from the effect of energy consumption on industrial output. Since reliable electricity, water supply and gas all enters into energy consumption, the government has a great role to ensure the supply. The availability of affordable and reliable energy supply to industries will increase profitability allowing for reinvestments of the rent. This has employment growth effect and therefore reducing unemployment rate in the country. A feedback mechanism of higher employment level is higher production level, which is actually in line with the government target of becoming a middle income country by 2025.

As it was pointed in Table 1, labor growth rate is lower compared to energy consumption growth rate. Consequently, the effect of labor on industrial output growth is economically larger than the effect of energy consumption in Tanzania. This is confirmed in the final model estimation results depicted in Table 3. This study has analyzed the policy effect on industrial output for industries with 10 or more employees. It is more useful to include those industries with less than 10 employees to see how they have been affected with the policy in comparison with the 10 plus industries. However, the current study failed to get data on this lower category for 2009 and therefore provides a room for future studies.

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References

Becker, S. O., H. Egger P., and von Enrlich, M. (2013). "Absorptive Capacity and the Growth and Investment Effects of Regional Transfers: A Regression Discontinuity Design with Heterogeneous Treatment Effects." *American Economic Journal: Economic Policy*: 29 - 77.

Bronzini, R., and Iachini, E. (2014). "Are Incentives for R&D Effective? Evidence from a Regression Discontinuity Approach." *American Economic Journal: Economic Policy*, 100 - 134.

Cooley, T. F, and Quadrini, V. (2006). "Monetary Policy and the Financial Decisions of Firms." *Economic Theory*, 243 - 270.

Davis, B. (2000). "India and the East Asia Miracle." *Agenda: A Journal of Policy Analysis and Reform*, 63 - 76.

NBS. *Annual Survey of Industrial Production, 2009.* Statistical Report, Dar es Salaam: Ministry of Industry and Trade, 2012.

NBS and MITI (2016). *The 2013 Census of Industrial Production: Analytical Report.* Census, Dar es Salaam, Tanzania: Ministry of Industry, Trade and Investment.

Nord, R., et al. (2009).*Tanzania: The Story of an African Transition.* Evaluation, Washington, D.C.: International Monetary Fund.

Papademos, L. (2006). "Policy - Making in EMU: Strategies, Rules, and Direction." *Economic Theory*, 25 - 38.

Parham, D. (2000). "A More Productive Australian Economy." *Agenda: A Journal of Policy Analysis and Reform*, 3 - 16.

URT (2016). *National Accounts of Tanzania Mainland 2007-2015.* National Statistics Report, Dar es Salaam: National Bureau of Statistics, and Ministry of Finance and Planning.

White, H. (1980). "A Heteroskedasticity - Consistent Covariance Matrix Estimator and a Direct Test for Heteroskedasticity." *Econometrica*, 817-838.

Wooldridge, J. M. (2013). *Introductory Econometrics: A Modern Approach.* Singapore: Cengage Learning.